Fourth Year
Quarterly Activity Report No.2

October-December, 2005

Food Security in Bangladesh:
Improving Wheat, Maize and Papaya Production,
And Impacts of Arsenic Contamination

USAID Grant No.388-G-00-02-00070-00

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Introduction

In this report, we describe the achievements by activity during October to December 2005 under the project on **Food Security in Bangladesh: Improving Wheat, Maize and Papaya Production in Impacts of Arsenic Contamination**, USAID Grant No. 388-G-00-02-00070-00.

Shortages of funds compelled us to discontinue some of the project components and also reduce some of the activities of the on-going components during 2005-06. The following four components will continue until June 30, 2006 with available funds for the year:

1. Facilitation and Promotion for Adoption of Mechanization by Growers
2. GIS - Bangladesh Country Almanac
3. Whole Family Training in Maize
4. Impacts of Arsenic Contamination on Agricultural Sustainability and Food Quality

The fifth component of the project, Papaya Improvement through Ring Spot Viral Disease Resistance, is planned to continue until June 2007.

Overall objectives of the program remain:

- Strengthen the partnership between the National Agricultural Research System (NARS)-NGO-Private Sector-CIMMYT and US Universities to achieve the goal of food security through wheat, maize and papaya production enhancement saving scarce natural resources and for better human nutrition
- Assist the Wheat Research Center (WRC), Horticulture Research Center (HRC) and Plant Breeding Division of Bangladesh Agricultural Research Institute (BARI) in their efforts to increase productivity of wheat, maize and papaya in Bangladesh
- Improve the rice-wheat system research activities of Bangladesh and strengthen exchange of research experiences in the subcontinent
- Offer leadership in assessment of the impacts of arsenic contamination on food security in Bangladesh
- Build up human capacity in Bangladesh to address food security issues in the targeted institutions
- Assist Government of Bangladesh in technology and extension strategies where appropriate for agricultural sectors to sustain self-sufficiency of food production.

Facilitation and Promotion for Adoption of Mechanization by Growers

Key activities planned	Target number	Time & duration	Achievements
a. Planning meeting with counterparts	Various	July-June 2005	Various meetings organized and completed at Rajbari, Faridpur and Dinajpur
b. Farmers' participatory demonstration of procured or imported agricultural accessories	At least 50 sets of seeders	July-June 2005	• 50 seeders (38 Dongfeng and 12 Sifeng) procured and sold / distributed among the farmers o Number of Seeders sold this quarter to: ▪ 2 units to Bangladesh Rice Research Institute (BRRI) ▪ 1 unit to Wheat Research Center for ADB funded project ▪ 3 units to farmers at Dinajpur ▪ 2 units to farmers at Rajbari • Planned to procure several close drum threshers during the wheat season
c. Survey on existing agricultural accessories	Survey the existing accessories to determine their status	Dec 2005	An additional adoption survey of PTOS in 2 districts (Dinajpaur and Rajshahi) planned but funds do not allow implementation
d. Repairing and servicing of existing equipment		Aug-Nov 2005	• Some repairing work done • Provided backstop services to the end users
e. Training of NGO, NARS Technicians, owners, users and operators	One weeklong workshop per month	July-Oct 2005	• Two training sessions completed at Rajbari district. A total of 114 power tiller accessories owners, technicians, operators and NGO personnel received training on the following topics: o Operation and maintenance course on power tiller, seeder, thresher and weeder o Modern wheat cultivation o Modern jute cultivation o Modern onion and garlic cultivation

Key activities planned	Target number	Time & duration	Achievements
		March 2006	• Planned to train 20 people on maize sheller repair, operation and maintenance by March 2006. The training will be conducted by BARI and CIMMYT
f. Hand over the equipment to end users	At least 50 BHT seeders/ power tiller and /other accessories	Sept-Oct 2005	• 38 units of seeder (28 Dongfeng and Saifeng 10) handed over to the farmers in high profile event presided over by BARI DG. • 27 Power tillers were sold to the farmers by a private company, through project financing • 2 tine sets sold to the farmers • A few close drum threshers will be procured and handed over to the farmer during the wheat harvesting season
g. Research and development of Agricultural Accessories	Seeding/ harvesting/ inter cultivation /tillage/etc.	July 2005-June 2006	• Research proposals received from: o FMPE-Division of BARI amounting to Tk. 188,000/- Meeting was organized on the proposal with concerned organizations on 31/10/05 at CIMMYT Dhaka office. All participants agreed to conduct the research as FMPE submitted in their proposal. The work has been going well under BARI supervision. o Wheat Research Center also submitted a research proposal on 1/11/05, amounting to Tk. 232,000/- . We agreed to support a maximum 170,000/- and the research activities are going well.
h. Field visit and monitoring	Various	July 2005 – June 2006	Various visits made before and during early past of Rabi season
i. Field technicians, full time	2 technicians (1 for Dinajpur and other for Rajbari)	July 2005 – June 2006	Two field technicians have been working at WRC Dinajpur and Rajbari, as planned. Several temporary technicians may require hiring for supporting new areas.

GIS-Bangladesh Country Almanac (BCA): A User Friendly GIS Tool for Agricultural, Forestry and Natural Resource Management

Key Activities Planned	Targeted Number/ Activity	Planned Time & Duration	Achievements during this quarter
a. Technical Implementation Committee Meetings	12 meetings	July 05-June 06	Several TIC meetings were held.
b. Dissemination / Training / Policy workshops	10 workshops with approx. 500 participants	July 05-June 06	• Organized dissemination workshop at Department of Agricultural Extension on November 17, 2005 where 30 participants attended. • DAE plans human resource development on BCA application. The training cost will be met from GOB fund. BCA development partners will assist the training part. They are interested to link their datasets with BCA which will produce useful maps for local level planning and development. The purpose is to strengthening the manpower in information technology towards BCA application.
c. Data procurement and preparation works (crops, biophysical, fisheries, forestry, health / nutrition, livestock, socio-economic)	List of datasets identified	July 05-May 06	The following data have been obtained from different sources: • Forest area by Upazilla • Flood damage and GOB relief allocation by district • Updated landuse map • Zone mapping for selected Upazilla • Nutrient status map updated • Digital Elevation Model (DEM) 90m x 90m downloaded and prepared to create shape files • Mouza names collected from different sources and updated the Mouza boundaries

Key Activities Planned	Targeted Number/ Activity	Planned Time & Duration	Achievements during this quarter
			A huge amount of crop, fisheries, socioeconomic, demographic and educational data of recent years was gathered from Department of Agricultural Extension (DAE) and Bangladesh Bureau of Statistics (BBS). Most of the data were at the district level (new 64 districts) and some were at the thana level. Data collected had some problems to feed directly onto BCA. These are: 1. Most of the data were messy and unorganized, i.e. not consistent with BCA data format. 2. In the BCA database, the number of our thanas in thana base map is 465 where all thanas in a metropolitan area are placed under one metropolitan thana. Thana-wise data collected from BBS has the same number of thana as in BCA, whereas DAE used 507 thana in recording thana-wise crop data. DAE considers these as agricultural thanas. 3. All data files did not have same spelling of district and thana names and also the districts and thanas were not placed in same order. 4. None of the data files contained geo codes of the districts or of thanas, that are necessary to join with BCA base maps. 5. Units of measurement were not the same throughout 6. All data files were in Excel but in most cases there was cell merging for reporting regional and divisional totals in case of district level data and district, regional and divisional total in case of thana level data. This created a problem in sorting data and merging files. 7. A few files contained inconsistent / erroneous data

Key Activities Planned	Targeted Number/ Activity	Planned Time & Duration	Achievements during this quarter
			In order to remove these problems and make the data files acceptable to BCA, all the data files were thoroughly and carefully examined, edited, corrected for errors and geo coded. In case where the number of thanas was larger than that in the BCA database, the relevant thanas were merged. Before geo coding and merging, the spellings of district or thana names were made unique with the same spelling as in the BCA database. To facilitate sorting and file merging, data in a file was labeled only by district or thana wherever applicable. The process was tedious and took considerable time to complete.
d. Upazila / block level digitization	DAE Block for selected Thana / District	January-March 06	Based on the open discussion on the block level workshop at DAE it was decided that Jamalpur, Sherpur and Tangail districts could be digitized to manage the Upazila database with the district. Computers are available in the Upazila office and therefore, the block data can be maintained by the Upazila and district office. A committee was formed from DAE officers incorporating the BCA Team who will look into the work performance of the assignment and suggest a future strategic plan.
e. Mini grant to promote use of BCA to various organizations / NGOs / Private sectors	3 in various locations	January -March 06	The mini grant will be awarded to different organizations to encourage people to apply what they learned with BCA in their own work with their own data. These small grants enable users to provide feedback on the need and area of further BCA development and to fix bugs in the new software.

Key Activities Planned	Targeted Number/ Activity	Planned Time & Duration	Achievements during this quarter
			Previous versions of BCA contained case studies of African Country Almanac on the use of BCA database and software. During the dissemination workshops and training conducted at different institutions on the application of BCA, the participants requested inclusion of case studies from Bangladesh instead of African ones. The expectation is that such replacement will facilitate the users to learn about BCA tools and databases to solve their own problems more easily than is possible with African case studies. In the meeting of the BCA Technical Implementation Committee it was decided to replace the African case studies by the case studies done with financial assistance of BCA mini grants. During the project period, 19 such case studies were done of which the committee selected 10 for inclusion in our BCA database. These case studies are different in nature and exhibit variety of uses of BCA tools and database. (a) Creation of new maps using BCA database, (b) integration of generated spatial and attribute data with BCA database and construction of thematic as well as integrated maps, (c) creation of need base shape files using other GIS software ant their integration with BCA as new map layer, (d) spatial analysis and map calculations, (e) creation of tables and charts are among many other uses of BCA tools and database exhibited in these case studies. The results of some of these case studies drew attention of the institutional and national planners in designing development and action plans.

Key Activities Planned	Targeted Number/ Activity	Planned Time & Duration	Achievements during this quarter
f. Product output validation activities with selected datasets	Various locations	February-April 06	Field validation of BCA outputs / products that need to be further refined before their dissemination and wider application.
g. Exploration and Establishment of BCA user group	Various organizations and universities	December 05-May 06	Identified some organizations / universities for training who will arrange to accelerate the use of BCA internally in future.
h. Visit of GIS expert of CIMMYT Mexico to train and identify the update of Software	One GIS expert from CIMMYT visited	October 2005	David P. Hodson, GIS expert of CIMMYT Mexico, paid a week-long visit to Bangladesh 10-15 October, 2005 to monitor the BCA activities, assist the partners to lay out the datasets, demonstrate the new software and to initiate future plans of BCA. The following activities have been initiated during his visit: o Demonstrated the new software with new features and tools; reported bugs and errors to software company and updated the software accordingly o Partners presented the new datasets and discussed for improvement; sorted for incorporation of new version o Focused present activities and future plans were prepared: ▪ Generation of very high resolution digital elevation model to create landtype layer from mapping unit ▪ Increased focus and inputs into local land use planning and land zoning activities in order to assist national and local government agencies. ▪ Editing and updating of data sets - major emphasis on Micro-level Database Refinement (Upazila) ▪ Create spatial database on pests and diseases ▪ Temporal changes of edaphic properties and cropping

Key Activities Planned	Targeted Number/ Activity	Planned Time & Duration	Achievements during this quarter
			pattern spatial database ▪ Institutionalization of GIS technologies. DAE has strong interest in BCA and real potential for implementation in the regional offices with a coupling to centralized data management. ▪ Expansion of the existing data resource base into areas closely related to agriculture, such as fisheries, livestock, forestry and human health. ▪ Web-based data dissemination would be increasingly used in parallel with CD-ROM / DVD based diffusion
i. Partners support / Lab activity / Mobility	Lab / field / mobility	July 05-June 06	To support the ongoing activities, partners will be provided some physical facilities in the lab
j. Publications ((20 mini grant reports), user manual (250 pages), brochure, BCA CD produced, video tutorial, evaluation, agenda)	500 copies of each item	August 05-June 06	• 50 distributed • 50 Video Tutorial CDs distributed • New brochure on BCA has been drafted • 10 minigrant reports have been abridged to include in new BCA version for use as case study
k. Basic promotion activities: flier, WWW	WWW site update regularly	April-June 06	Using the ARCIMS the digital maps will be uploaded in the web so users have the maps and can query the data. The server will be maintained in CIMMYT HQ

Whole Family Training in Maize

Key activities planned	Targeted no. /achievement	Time & duration	Achievements
a. Review last year's (2004-05) WFT Progress and Planning Meeting for the Year 2005-06	Various meetings	July / Aug 05 February 06	Review and planning meetings held in the CIMMYT office in Bangladesh during September 7, 2005, proceedings circulated (Annexure A-1) and decisions are being followed by the partners.
b. Bangla manual and poster printing	2,500 manuals 25 sets posters	July-Sept 2005	• 2,500 sets of manual printed and distributed to the trainers and families • Modified 27 sets of posters distributed to trainers and research organizations, NGOs and private entrepreneurs
c. Trainers' training	250 trainers	Aug-Oct 2005	100% TOT completed. In all training venues, 100% male participants were participated in the TOT except in Bandarban where 33% female participants attended.
d. Train Farmer Families'	2000 Farmer Families Trained	Sept-Dec 2005	100% family training completed. On an average, 51% of the total trainees were male and 49% were female.
e. Maize germplasm importation and distribution among GOs / NGOs / private sectors	Maize trial sets / inbred	Sept 2005 Feb 2006	CIMMYT Maize Germplasm imported and distributed to the GO and NGO partners for evaluation.

Key activities planned	**Targeted no. /achievement**	**Time & duration**	**Achievements**
f. Applied research and technology demonstrations: i. Varietal trials ii. Promising lines evaluation trials iii. Maize based intercropping systems iv. Fertilizer management for maize-base systems v. Demo. on BARI released hybrid maize vi. Demo. on maize intercropping systems vii. Demo. on different maize establishment methods (bed, zero tillage) viii. Demo. on modified N management	Various	Oct 2005-April 2006	All experiments established timely and necessary data are being taken for analysis
g. Promotion of BARI released hybrid maize through F1 seed and parental seed increase.	kg seed production	Aug-June 2005/06	• 3,000 kg of BARI hybrid seed procured and have been distributing among the maize whole-family training program families. • BARI planned steps to increase 5 parents for BARI Hybrid maize and produce F1 seed during this year.
h. Pest (insect) survey in the maize production environment	Conduct surveys	Nov 05 - April 06	Deferred for next year (if budget available)

Key activities planned	**Targeted no. /achievement**	**Time & duration**	**Achievements**
i. Field day on maize cultivation technologies	Management practice	Nov 05- Jun 06	Planning completed
j. NARS partners existing facilities improvement and skill development of GO and NGO on hybrid maize seed production and modern maize cultivation	Lab / field research / storage / mobility	July 05 - Jun 06	BARI conducted a two-day hybrid maize seed production training with their own fund and with the technical assistance from CIMMYT for the field technicians of BADC and BARI. Total trainees were about 30 persons.
k. Monitoring trainers and family training, research and demonstration fields	Various	July 05-June-06	CIMMYT Scientists attended several TOT and family training sessions in this quarter and more visits are planned

Development of Ring Spot Virus Resistant Transgenic Papaya in Bangladesh

Key activities planned	Targeted no. of trainees /achievement	Time & duration	Achievements
a. Work on regulatory and bio-safety guidelines	Conduct various informal and formal meetings	July 2003-June 2006	An application to the Appropriate Regulatory Authority for Contained Greenhouse and Contained Open Field Testing of Papaya Ringspot Virus Resistant Transgenic Papaya was developed and circulated in BARI and elsewhere in August 2005 and submitted to BARC in September. When approved, BARI will be able to import, test, and possibly release virus-resistant papaya lines that are being developed by Cornell University and USDA in Hilo Hawaii, USA.
b. Transformation of Bangladeshi strains at USDA, Hawaii	Transformation of strains at USDA	Sept. 2004 – June. 2006	Cloned the full length coat protein gene of the Bangladesh PRSV strain, engineered the gene into the transformation vector, and transformation of papaya with that full length gene will be done shortly.
c. Engineer CP gene of BD strains to develop transgenic plants at Hawaii	Engineer CP gene for transgenic	Nov., 2004 – June., 2006	Completing the gene construct with segmented coat protein genes from PRSV isolates from Bangladesh which will then be used to transform papaya. Obtained a patent on the synthetic gene construct technology which will help to ensure the practical application of the technology to Bangladesh.
d. Development of transgenic papaya plants and their multiplication through tissue culture and establishment of plantlets at USDA	Development of plants and their multiplication	Jan., 2005 – June, 2006	Further transformations took place during the report period at USDA to develop ring spot virus resistant papaya plants. We have quite a number of transformed plants with the synthetic gene that will be destined for Bangladesh during 2006.

Key activities planned	**Targeted no. of trainees /achievement**	**Time & duration**	**Achievements**
e. Testing of transgenic lines at USDA / BARI	Testing appropriate lines	Jan., 2005 – June, 2006	Transgenic papaya materials became ready to transfer to Bangladesh for evaluation of resistance to PRSV and ultimately horticultural characteristics during this report period. We have started molecular characterization of the transgenic lines that will be sent to Bangladesh. This will help in the deregulation process in Bangladesh.

Impact of Arsenic Contamination on Agricultural Sustainability and Food Security

Key Activities Planned	Targeted no. of equipment/ samples/ persons	Planned Time & Duration	Achievements	Remarks
a. Graduate degree programs in Bangladesh / USA	Four Bangladeshi scientists (three at BAU and one at CU)	Final year: July 2005-June 2006	The three fellows in Bangladesh completed their T.Aman 2005 experiments. Their thesis research topics and objectives were given in the last quarterly report. They are continuing their lab analytical work at the BAU Lab and the BARI-CIMMYT Lab. The fellow doing his PhD at CU is expected to complete his course work this winter semester. He has completed a part of his thesis research (reported in the last Qr. Report), and is preparing to start pot experiments with high As soils to study As species in soil-water, As mineralogy, plant uptake of As.	The in-country PhD fellows are expected to complete their thesis research and write-up by June 2006.
b. Assessment of As in irrigation waters, soils and crops of Bangladesh	30 sites in low-As and high-As areas	October 2005-May 2006	The objectives of this work were reported in detail in the last quarterly report. The number of sites had to be cut down to 15 instead of 30 due to fund constraints. Sample collection has not yet been started. The work will start in the third week of January 2006. Earlier, a nationwide survey of arsenic in irrigation waters, soils and 70 different crops including rice, maize and wheat in 184 unions of 92 thanas covering 24 AEZs was completed. GIS mapping of the findings have been developed and the maps are being refined for use in a database. Please see an example in Fig. 1. An abstract was submitted for presentation of a paper in the 18th World Congress of Soil Science to be held in Philadelphia, USA in July 2006 (Annexure B-1)	This will provide a time-series data set that will give insights into the pattern of As accumulation (or depletion) in soils of Bangladesh. So far as our knowledge goes, there is no such As data in the country.

Key Activities Planned	**Targeted no. of equipment/ samples/ persons**	**Planned Time & Duration**	**Achievements**	**Remarks**
c. Study of As in water, soil and rice in a T.Aman –Boro pattern at one long-term monitoring site	One shallow tube well (STW) command area in Faridpur to serve as a long-term monitoring site	July 2005-May-June 2006	An experiment was conducted in T. Aman 2005 in a high-As irrigation command area at Paranpur, Faridpur. Arsenic in the soil and porewater was monitored. There were clear indications that high As in soil and porewater was adversely affecting the growth of the plants by reducing the root and shoot biomass. The rice crop (the most popular variety in Bangladesh, BR11) was harvested in the last week of December. Post-harvest data processing and chemical analyses to assess as uptake and accumulation in straw and grain at various levels of soil/porewater As are in progress. Although, at the initial growth stages soil As showed a clear adverse effect on plant biomass, the effect of As on grain yield was not as consistent. However, it did seem with data from some of the fields that soil was affecting grain yield. For details, please see the copy of an abstract submitted for presentation of a paper in the 18th World Congress of Soil Science to be held in Philadelphia, USA in July 2006 (Annexure B-2). The experiment will be repeated in Boro 2006 for more conclusive results where a relatively uniform regime would exist compared with the T. Aman season. Preparations are under way to set up the experiment in mid-January, 2006.	These findings may have very important implications. So far we noticed elevated As in rice grains, without yield reductions, but now we got the first indication of a build-up of As in the water-soil system to levels that seem to threaten yield in FARMERS' FIELDS. Productivity could be at risk in areas where As build-up in the soil goes unchecked. Long-term studies at a few more monitoring sites need to be conducted to confirm the potential impact of As not only on food quality but also crop productivity.

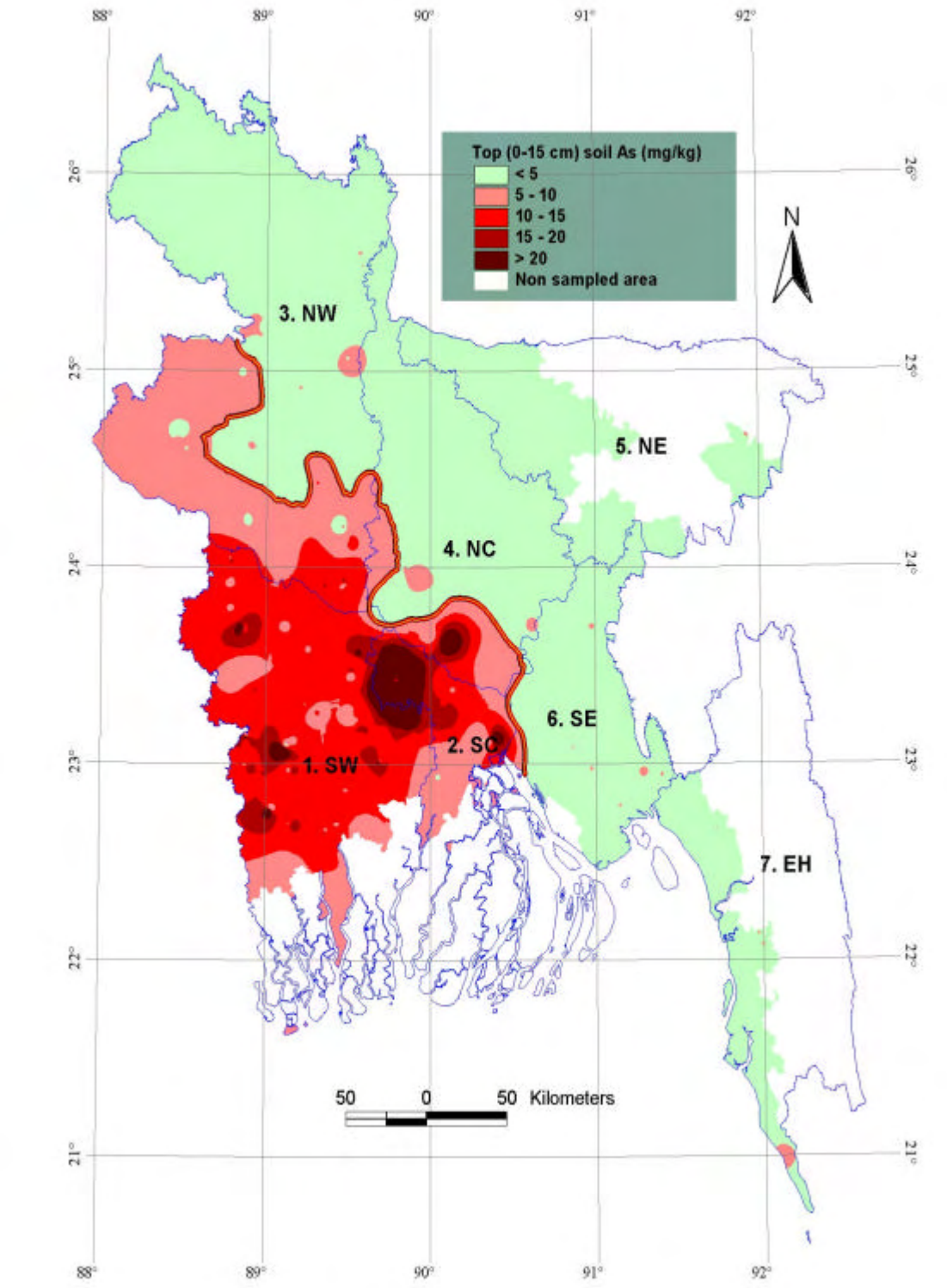

Fig.1. Map of Bangladesh showing delineation of areas with high and low As in soils. The broad red line separates region with topsoil As > 5 mg/kg from that with topsoil As < 5mg/kg.

Annexures

A1: Proceedings of planning meeting on maize whole family training

B1: Abstracts on arsenic contamination of waters, soils and crops in Bangladesh

B2: Abstracts on arsenic in soil and its effect on the growth of rice at a high-arsenic site in Bangladesh

Annexure A

A1: Proceedings of planning meeting on maize whole family training

Annexure A-1
Proceedings of planning meeting on maize whole family training

CIMMYT INTERNATIONAL MAIZE AND WHEAT IMPROVEMENT CENTER
CENTRO INTERNACIONAL DE MEJORAMIENTO DE MAIZ Y TRIGO

Sustainable Maize and Wheat Systems for the Poor

MEMORANDUM

To: All Team Leaders of Maize Whole Family (MWF) Training Program 2005-06
From: Dr. Nur-E-Elahi, CIMMYT Affiliate Scientist (Maize) and Dr. Stephen R. Waddington, Regional Agronomist for South and East Asia & Country Liaison Officer for CIMMYT Bangladesh
cc: Director General, BARI, Gazipur
Director (Research), BARI, Gazipur
Director (Field Service Wing), Department of Agricultural Extension (DAE), Khamerbari, Farmgate, Dhaka
Date: September 18, 2005
Subject: **Proceedings of the MWF training program planning meeting for the year 2005-06**

A participatory planning meeting on MWF training was held at CIMMYT Bangladesh office on September 07, 2005 at 9:30 a.m through 1:00 p.m. Team Leaders, active maize scientist of BARI and Dr. ANM Waliullah, Deputy Director (Field Service Wing), DAE, scientists from CIMMYT Bangladesh were participated (participants list attached herewith) and contributed in the planning meeting. The purpose of the meeting was to share ideas of last years maize whole family training program and finalize the program of MWF training for the year 2005-06. Dr. Md. Motiur Rahman, Director (Research), BARI chaired the session. A further meeting for NGO/private sector partners was held at CIMMYT the following day, September 8.

Dr. Stephen R. Waddington, CIMMYT Agronomist welcomed the participants attending in the meeting and thanked to Director Research of BARI for his presence, participation and contribution in the meeting. He also thanked all the MWF training maize team leaders and scientists for their hard work in making the last year's program successful. He hopes to see an even more successful program for this year.

Dr. Nur-E-Elahi, CIMMYT Affiliate Scientist (Maize) initiated the discussion and gave a broad overview of the last years' experience and shared among the scientists some of the useful research information generated from the last years work. Dr. Nur-E-Elahi also drew attention of the maize scientists to some of the emerging issues like maize yield stagnation, soil fertility in the rice-maize farming systems, crop residue management, maize based intercropping and maize expansion opportunity in the south, south east (hilly areas) and north eastern rainfed region of the country. Thereafter, the chairman conducted the meeting as per agenda.

All MWF training team leaders shared their experiences from last year and presented current year's (2005-06) MWF training program plan including number of families to be trained, initiation and completion of trainers and family training dates and venues in the meeting for open discussion and final approval.The table below shows the distribution of families to be trained during 2005-06 in each BARI Regional Agricultural Research Station (RARS), On-farm research station and division.

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Dr. ANM Waliullah, Deputy Director (DD) of DAE expressed his sincere thanks to CIMMYT for inviting him to the MWF training planning meeting. He mentioned that though he was not well aware of the whole family training concept, from this meeting he got a clear idea about the concept. He said that the whole family training could be an excellent and effective approach to transfer production technologies of all field and homestead crops. He further mentioned that the DAE should introduce this whole family training approach into their technology transfer related training programs. Dr. Waliullah further assured DAE's continued support to this MWF training program for the promotion of maize in the country. He will also notify his Deputy Directors (DD's) of all maize whole family training districts to provide full support in implementing the maize whole family training program in their areas.

Dr. Waliullah also agreed to conduct 60 demonstrations in 60 potential locations of 64 districts through DAE demonstration program plan in 2005-06. BARI developed hybrid maize such as BHM-2, BHM-3 and BHM-5 (quality protein maize) will be used for the demonstrations.

CSO and Head Plant Breeding BARI will ensure the delivery of BARI developed hybrid maize seeds to the office of the director field service wing or to Dr.Waliullah,DD, FSW, Khamarbari, Dhaka. The DAE will conduct the demonstration with their own resources.

Ms.Smita Hilton, CIMMYT accountant gave a presentation on the procedures of fund release and fund adjustment. For better management of CIMMYT accounts and to submit the financial report to the donor on time, Smita proposed to release the fund in two installments. 50% of the total budget will be released in a first installment. Upon satisfactory submission of the first adjustment, the remaining 50% of the budget will be released. All team leaders and scientists agreed on her proposal of fund release and fund adjustment procedures.These funding procedures will be followed in immediately.

BARI RARS/division-wise family distribution for 2005-06 whole family training program

Station/division	No. of families to be trained
Plant Breeding Division, BARI, Gazipur	160
RARS, Jamalpur	128
RARS, Jessore	128
RARS, Ishurdi	128
RARS, Barisal	80
OFRD, Kishorgonj	48
OFRD, Noakhali	48
OFRD, Tangail	48
OFRD, Faridpur	112
OFRD, Patukhali	48
OFRD, Rangpur	160
OFRD, Pabna	112
OFRD, Kushtia	112
WRC, Dinajpur	96
RWRC, Rajshahi	128

B. ***Districts, upazilas and blocks for the whole family training program:***
It was agreed that all Team Leaders (TL) will submit the final list of districts, upazilas, and blocks along with the trainers and family training dates to CIMMYT Bangladesh as early as possible. The TLs will finalize this in consultation with the DAE/private entrepreneurs personnel at districts, upazila and blocks level.

C. ***Training materials, seeds and fund:***
CIMMYT Bangladesh will supply the training materials, seeds and fund for the training. The training aids and funds will be sent on or before September 25, 2005 and the seeds (BHM-2,/BHM-3/BHM-5) will be delivered on or before October 30, 2005 at the respective RARS/OFRD/WRC/RWRC. A list of training materials showing its distribution to each of RARS/OFRD/WRC/RWRC /NGO's are enclosed herewith. ***All stations MWF training leaders will get the training kits (methods of germination test, fertilizers, sheller, live maize plant of 8-9 leaf stage etc.) prepared for display purpose during the trainers and family training sessions.*** The training materials especially the germination methods will be prepared as per dimensions and specifications described in the Bangla training manual.

D. ***MWF trainers and family training dates:***
All MWF training leaders will begin and complete trainers and family training sessions preferably after the Holy Ramadan. But in some locations where maize planting begins from mid November, trainers and family training will be completed on or before November 15.

E. *Family selection criteria:*
Characteristics of family:
Two male and 2 female adults (total 4) of a family will be selected for the training and will commit to grow maize in at least 1 bigha (33 decimal) of land during 2005-06. A three member family having at least one male and two females or one female and two males can also be eligible for training. In exceptional cases, a two member family (husband and wife only) not exceeding more than 3 such families in a session can be eligible for whole family training. The family must be cooperative and participatory in the whole family training program.

F. Subject matter of the training will be only on modern maize cultivation practices through poster, video and Bangla manual. Any information not directly related to maize cultivation will be delivered by the resource persons/trainers during the trainers and family training sessions. During the family training sessions, one BARI maize scientist will be present as the resource person and assist the trainers (BS) in organizing and conducting the family training in a very participatory manner.

G. *Methodology for training:*

a. The BARI scientists will train the Block Supervisors (BS) of DAE and Field Organizers (FO) of Doyel and other NGOs. The BS and FO will then train the farmers during family training session. Each group of 8 maize families will be trained by the one BS or FO in a session.
b. Each family will be personally invited by written invitation card
c. Family means, 4 adult members of a household, usually husband, wife, adult daughter and son (if the husband is ill or absent then the older son can attend).
d. Two of the family members must be females without exception.
e. Selection of the trainers will be done by the Team Leaders of Maize Whole Family Training program.
f. Always female trainers will be given preference.
g. Farm families who are directly involved in maize cultivation and who are committed to cultivate maize in at least a bigha of land (33 decimal) after the training will be carefully selected for the training. Selected families will have irrigation facilities and can afford to use recommended fertilizers for maize cultivation.

h. Two sessions (morning and afternoon) will be conducted in a day and in one venue. Suggested session time is 9:30 a.m. to 12:00 p.m. and afternoon session will be from 2:00 p.m. to 4:30 p.m.

i. Team Leaders will identify suitable venues for trainers training. Family training venues will be in a suitable place of the selected block or any other prominent place with good communication and power supply facilities.

j. A **U-shaped** sitting arrangement will be strictly followed in both the trainers and family training sessions, but in places where this arrangement is not possible, the existing arrangement or any other arrangement suitable for the 8 families or 32 persons will be all right. ***Each family should sit together during the training session. No separate sitting arrangement such as male in one side and the female in the other side will be allowed.***

k. Video on maize production **will** be shown during the trainers and family training sessions. Where electricity is not found, a generator will be hired, if available.

l. Each and every BS and/or FO will deliver invitation card personally to each of the eight families under his/her respective block. The Team Leader/Resource Persons/Observer whoever will conduct the family training session will do the pre-training maize cultivation knowledge assessment in the training session (before beginning the training) through a structured questionnaire supplied by the CIMMYT.Therefore, pre-training knowledge assessment of the three randomly selected family training sessions will be done. Similarly, the same families will be monitored for the post-training assessment by the maize whole family training leaders through a CIMMYT developed simple survey form.

H. Post training activities:

Maize scientist from each station will visit each family already identified in the training session and record the production practices used by the families. They will visit maize fields of other trained families and assist them solving maize cultivation problems if any.

I. Incentives for each family:

l. One invitation card for the family
m. Two kg of either BHM-2 or BHM-3 or BHM-5 hybrid maize seed
n. Tk. 200 to cover transportation costs
o. Certificate
p. One Bangla manual

J. Demonstration Inputs:

All demonstrations will be done in a farmer participatory and contributory manner. While demonstrating any technology (agricultural machinery demonstration, varietal demonstration, cultura practice demonstration, etc.) with the farmer and in the BARI experimental farms, the project will make available agricultural machinery, seed and fertilizers AND farmers will take care of the rest of the inputs like labor, land and other management practices needed during the crop growth and post harvest period.

K. Quarterly Progress Report:

All Team Leaders will submit a brief 1-2 pages quarterly progress report (1st Qtr. Jul - Sept, 2nd Qtr. Oct-Dec, 3rd Qtr. Jan-Mar, and 4th Qtr. Apr -Jun) to CIMMYT Bangladesh in a format provided by the CIMMYT

L. Photo Album:

All team leaders will take quality photo graphs and prepare a photo album for the trainers training, family training and field activities for their own record and for CIMMYT Bangladesh.

M. Fund Adjustment:

The adjustment will be submitted to the CIMMYT office within 7 days from the date of completion of the trainers training and whole family training program as per CIMMYT

adjustment form. To expedite this matter, a part time accountant could be hired for processing the vouchers and making the adjustment for submission. A lump-sum of Tk. 500/- (taka five hundred) may be given to the accountant as an incentive for a season from the approved budget of whole family training program.

Dr. Stephen R. Waddington in his remark thanked the BARI MWF training team for their excellent presentation as well as bringing new issues for future research. He assured the team members of CIMMYTs' continued support to the maize research and development in Bangladesh and requested them to keep continuing good work this year.

The Chairman in his concluding remarks thanked Dr. Stephen for inviting him to this planning meeting. He also thanked all the BARI scientists engaged in this MWF training program for their cooperation in conducting this meeting successfully and requested all Team Leaders to accomplish the training program as per schedule date and time. The meeting ended at 1:00 p.m. with thanks to all participants from the session chairman.

MWF Training Planning Meeting with BARI
September 7, 2005

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MWF Training Planning Meeting with BARI
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MWF Training Planning Meeting with BARI
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MWF Training Planning Meeting with BARI
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24	Firoz Akhtar CSO	Plant Breeding BARI, BARI.	CSO Breeding BARI, Joy		7.9.05

Annexure B

B1: Abstracts on arsenic contamination of waters, soils and crops in Bangladesh

B2: Abstracts on arsenic in soil and its effect on the growth of rice at a high-arsenic site in Bangladesh

Annexure B-1

Abstract submitted to the 18th World Congress of Soil Science to be held in Philadelphia, USA, July 2006.

Arsenic contamination of waters, soils and crops in Bangladesh

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The installation of hundreds of thousands of shallow tube wells (STW) in Bangladesh over the last three decades supplied “safe” drinking water for the people and, also, has been an important contributor to the tripling of the annual production of rice, the staple food crop. However, within two decades, As contamination of the all important groundwater began to show up and presently, many millions of Bangladeshis face a two-way risk of exposure to As, directly through drinking water and indirectly through food crops grown on soils contaminated by high-As groundwater irrigation. In early 2002, we began a systematic study of the nature and extent of the As problem in Bangladesh agriculture and food. One of our objectives has been to assess the As contamination status of irrigation waters and soils throughout the country and its impact on food quality. Here, we report some findings of a national survey on As in agricultural systems conducted in 2004-2005. During this period, irrigation water, soil and crop samples (both rice and non-rice crops) from 184 unions of 92 of the 450 thanas (a thana is the smallest administrative unit in Bangladesh) across the country were collected and analyzed for As using the HG-AAS procedure. The national survey showed very wide ranges of As contamination in waters, soils and crops across Bangladesh. Seventy-seven percent of the 355 STWs (irrigation tubewells) sampled had a relatively low As content, <100 µg/L, 15% had a high As level (100-200 µg/L) and the remaining 8% had very high As, >200 µg/L. The As content in the soils ranged from negligible to 64 mg/kg, with an average of 6.5 mg/kg for 394 soil samples. About 55% of the samples had an As content of <5 mg/kg, but at least 25% of the soils had high As levels of 10 to >20 mg/kg. Such high As levels in soils may be undesirable for crop production, especially rice, because chemical and biochemical conditions in the traditional

wetland rice production system favor the mobilization of As from the soil. Out of the 345 samples of irrigated rice (dry season rice, locally called Boro), the grain As content in about 50% was greater than 0.2 mg/kg, with a range of 0.04 to 1.10 mg/kg and an average value of 0.31 mg/kg. The corresponding wet season rain-fed rice had a mean grain As content of 0.17 mg/kg. Because rice is the staple food in Bangladesh and it is consumed in large quantities (450 g/adult/day), As contaminated rice could be an additional human health risk along with As-charged drinking water in many areas of Bangladesh. The As contents in the human edible parts of 70 different non-rice crops, like wheat, maize, leafy vegetables, tomato, chili, beans, etc. were also determined. While As in the upland cereals, maize and wheat, was found to be negligible, most other crops, especially, the leafy vegetables and tubers appeared to accumulate As in amounts double or triple that of rice. However, the risk from these crops would be low since the human consumption of the edible parts is much lower than that of rice. An important finding was the lack of straightforward interrelationships among the As contents of irrigation waters, soils and crops. Individual and interactive impacts of irrigation water As, "background" soil As, land type and land form, flooding patterns, chemical and mineralogical processes, cropping sequences, water management, etc. need to be studied in details for information contributing to local and regional delineation of the actual and potential As hazard. Future research should focus on water-soil-crop management systems to minimize the As risk in Bangladesh agriculture and food.

Annexure B-2

Abstract submitted to the 18th World Congress of Soil Science to be held in Philadelphia, USA, July 2006.

Arsenic in soil and its effect on the growth of rice at a high-arsenic site in Bangladesh

G.M. Panaullah[1], **T. Alam**[1], **J.M. Duxbury**[2], **R.H. Loeppert**[3], **C. A. Meisner**[4] and **J.G. Lauren**[5], **S.R. Waddington**[1] (1)CIMMYT Office in Bangladesh, House no.18, Road no. 4, Sector no. 4, Uttara, Dhaka, Bangladesh, (2)Cornell University, 904 Bradfield Hall, Ithaca, NY 14853, (3)Texas A & M University, College Station, Houston, TX 77843-2474, (4)IFDC, Road 54A, House no. 2, Apt. no. 6, Gulshan 2, Dhaka, Bangladesh, (5)Cornell University, 917 Bradfield Hall, Ithaca, NY 14853

Arsenic in soil and its effect on the growth of rice at a high-arsenic site in Bangladesh

Arsenic contamination of the irrigation water-soil system is emerging as a big problem in Bangladesh threatening agricultural production, food quality and ultimately the health and well being of many millions of people. Elevated levels of As in soils and crops, especially rice, the staple food crop have been reported from different parts of the country. This has been, due, partly, to the use of high-As groundwater pumped out by shallow tube wells (STW). High As in rice grain can become a public health hazard. There is another potential risk, that of As affecting rice growth and yield, undesirable for Bangladesh with a high demand for rice. However, to date, little information on the growth retardation or yield loss of rice in farmers' fields in the As-affected areas of Bangladesh is available. We looked for indications of this in a high-As STW command area through a simple experiment in the wet season rice growing period, June to November, 2005. A 3-ha STW (32 m deep) command area in Paranpur of the As-affected district of Faridpur in central Bangladesh was the experimental location. Experimental plots, 4mx4m in size, in 10 fields across the command area with total soil As ranging from 15 to 57 mg/kg were set up. Transplanting with 25-30 days old rice seedlings (variety BR11) was done during 25-28 June. Soil samples at four different depths up to 60 cm at 15-cm intervals from the top were collected at the start of the experiment and analyzed for total, oxalate and dithionite extractable As, Fe and Mn. Arsenic was determined by the HG-AAS procedure and Fe and Mn in AAS. The collection of other data was scheduled to match the critical growth stages of the rice crop, i.e., mid-August (active tillering stage, AT), mid- September (panicle primordia initiation stage, PI), and mid-November (maturity). Soil pore-water was collected in mid-August when the soil was saturated with rainwater, and analyzed for As, Fe, Mn and P. Pore-water sampling could not be done later on as the soil started drying with the fast decreasing rainfall. At the AT and PI stages, agronomic data, such as, plant height, tiller no. per plant, root and shoot dry matter yields were taken. The crop was

harvested on November 17, within a 5 sq m area per plot. Plant samples were taken for determining As in the roots, shoots, straw and grains. At the early stages of growth, the rice plants were very visibly poor in the high As plots. The pore-water As content ranged from 54 to 973 ug/L, which correlated well with the total soil As. Pore-water As appeared to be a good indicator of plant growth at the early stages, affecting all the plant growth parameters measured and also As uptake by the rice plants. However, as the soil started drying, we noticed the crop recovering, faster in fields on the higher positions of the command area landscape. We noticed a large, consistent decrease in the total soil As content with soil depth, indicating that As was not very downwardly mobile. The water regime, and by implication, soil reduction and associated mobility of As and its availability to the plants could be important factors regulating As uptake and its impact on plant growth. Soil As seemed to have no consistent effect on rice yield. However, although the crop recovered outwardly, maturity was greatly delayed in the high-As plots. About 40-50% of the grains in the high-As plots remained green, at the milk stage. Generally, grain yield was very poor, only 2.0-2.5 t/ha (rough rice), which was much less than about 4.0-5.0 t/ha that BR11 yields in a normal soil-water setting. This low yield was suspected to be due to the relatively high As in the soil across the command area. We hope to get a clearer answer to the question of whether As reduces rice yield through our planned study at the same site in the coming irrigated winter rice, when the soil will remain flooded with irrigation water throughout the growing season and the effect of uneven soil drying will be eliminated.